

WE CLAIM:

1. An integrated circuit having copper interconnecting metallization, a portion of said metallization exposed to provide a contact pad to said integrated circuit, comprising:
 - one or more layers of conductive barrier metals positioned on said exposed portion of said copper metallization;
 - 10 a bondable metal layer positioned on said barrier layer, said bondable layer having a thickness suitable for wire bonding, and an exposed surface; and
 - 15 a protective overcoat layer surrounding said bondable layer so that the exposed surface of said bondable layer lies at or below the exposed surface of said overcoat layer.
2. A metal structure for an integrated circuit having copper interconnecting metallization, a portion of said metallization exposed to provide a contact pad to said integrated circuit, comprising:
 - a conductive barrier layer positioned on said exposed portion of said copper metallization;
 - 20 a plug of bondable metal positioned on said barrier layer; and
 - 25 a protective overcoat layer surrounding said plug so that the exposed surface of said plug lies at or below the exposed surface of said overcoat layer.
- 30 3. The metal structure according to Claim 2 wherein said overcoat thickness ranges from about 0.6 to 1.5 μm .
4. The metal structure according to Claim 2 wherein said

- overcoat layer overlaps between about 0.1 and 0.3 μm over said plug perimeter.
5. The metal structure according to Claim 2 wherein said overcoat comprises one or more layers of silicon nitride, silicon oxy-nitride, silicon dioxide, silicon carbide, or other moisture-retaining compounds.
6. The metal structure according to Claim 2 wherein said bondable metal plug is aluminum or an aluminum alloy.
7. The metal structure according to Claim 2 wherein said 10 plug has a thickness between about 0.4 and 1.4 μm .
8. The metal structure according to Claim 2 further comprising a ball bond attached to said plug.
9. The metal structure according to Claim 2 wherein said barrier layer comprises tantalum nitride.
- 15 10. The metal structure according to Claim 2 wherein said barrier layer is selected from a group consisting of tantalum, titanium, tungsten, molybdenum, chromium, vanadium, alloys thereof, stacks thereof, and chemical compounds thereof.
- 20 11. The metal structure according to Claim 2 wherein said barrier layer has a thickness between about 0.02 and 0.03 μm .
12. The metal structure according to Claim 2 wherein said barrier layer is patterned to the same area as said 25 contact pad portion of said metallization.
13. The metal structure according to Claim 2 wherein said plug of bondable metal is patterned to the same area as said contact pad portion of said metallization.
14. The metal structure according to Claim 2 wherein a 30 portion said overcoat layer overlaps the perimeter of said plug.
15. A wafer-level method of fabricating a metal structure

for a contact pad of an integrated circuit having copper interconnecting metallization, comprising the steps of:

- 5 chemically-mechanically polishing said wafer to expose the patterned contact pad areas of said copper metallization embedded in insulating material;
- 10 depositing a barrier metal layer over said wafer including said exposed copper metallization;
- 15 depositing a bondable metal layer over said barrier layer in a thickness sufficient for wire ball bonding;
- 20 patterning both said deposited metal layers so that the layer portions outside said contact pad areas are removed and the layer portions over said contact pad areas remain to form a bondable metal plug over each of said contact pads;
- 25 depositing a layer of protective overcoat over said wafer, including said metal plugs of said patterned layer portions, said overcoat layer having a thickness so that the exposed surface of said overcoat layer lies at or above the exposed surface of said bondable metal layer;
- 30 opening windows in said overcoat layer so that said bondable metal plugs are exposed.
16. The method according to Claim 15 wherein said step of depositing a bondable metal layer includes aluminum in the thickness range from about 0.4 to 1.4 μm .
35. The method according to Claim 15 wherein said overcoat has a thickness in the range from about 0.6 to 1.5 μm .
30. The method according to Claim 15 wherein said overcoat frame has a width between about 0.1 to 0.3 μm .

19. The method according to Claim 15 wherein said opening in said overcoat layer leaves a frame of overcoat around the perimeter of each plug.

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